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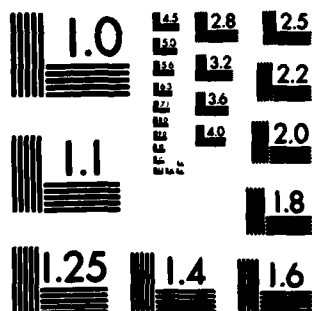
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FEDERAL INFORMATION SYSTEMS MANAGEMENT:
PROBLEMS, SOLUTIONS, AND MORE PROBLEMS

by

Dan C. Boger
Carl R. Jones

and

Norman R. Lyons

July 1986

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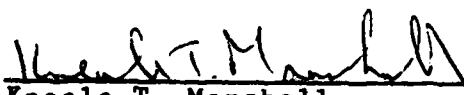

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**Federal Information Systems Management:
Problems, Solutions, and More Problems**

by

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Introduction

Sometimes it seems there is nothing but horror stories in the Federal government EDP management. The list of problems is long, and it cuts across all agencies of the government. Some examples include:

- The World Wide Military Command and Control System (WWMCCS). WWMCCS is a twenty year old system which provides real time information about the status of military equipment and units. It uses a world wide network of computers to exchange information. The system has been plagued by poor software design and reliability problems. There is little doubt that it cannot fulfill its mission.
- The Social Security System. This information system was a model when it was first set up in the early 1960's. With a growing workload and without significant improvements, it has been experiencing major problems during this decade. Recent attempts to upgrade the system have resulted in numerous contractual disputes with both legislative and judicial solutions proposed.
- The Navy APADE System. In the early 1970's it became apparent there were several problems in information processing within the Navy small purchase procurement process. In 1974, the Navy started a project to automate procurement (Automation of Procurement and Accounting for Data Entry). By 1979, the project was still unfinished. Further development on the original project was abandoned and a new development effort was begun which is still underway.

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Numerous solutions to such problems have been proposed. It seems as if the list of proposed solutions is as long as the list of problems. These solutions include:

1. Contract out more government data processing ("the private sector does it better").
2. Institution of new rules governing EDP management ("bureaucrats are incompetent or untrustworthy").
3. The institution of new organizations to manage EDP resources ("empire building").
4. The establishment of special roving computer-expert groups to correct EDP problems in Federal agencies ("SWAT teams").

The proposed solutions usually have two things in common. First, they tend to be inspired by the political goals, both organizational and national, of the person proposing them. Second, they are usually mechanical or procedural changes that focus only on symptoms of the problem. But such proposed solutions are inadequate since Federal EDP management problems spring from causes that will not respond to minor administrative tinkering. As with everything else in the Federal government, the management of data processing is imbedded in overall social and political processes.

Decisions concerning Federal EDP management must reflect social and national political goals. Examples include:

1. Encouragement of competition in the computer industry.
2. Encouragement of small business.
3. Aid to a particular company or sector of the economy.
4. Employment of minorities.

5. Openness of the government procurement process.

The list is not exhaustive. We do not mean to imply that such external considerations do not exist in EDP management decisions in the private sector. They obviously do. In the private sector, however, the overriding measure of effectiveness is the profitability of a single corporation. This is far less complex than the social welfare of a diverse country of 240 million people.

It is this incorporation of social goals into decision processes that makes government EDP management different from the private sector. A Federal government EDP manager faces a more complex decision problem than a private sector manager faces. This has a real impact on the decisions that result.

The government decisions are rational, but they are rational within a different framework. Mechanistic solutions that do not reflect the underlying social and political framework are not likely to produce any real long term changes. Long term, effective solutions must incorporate an understanding of the fundamental social and political influences on government computer management. Conversely, such influences which are adverse to efficient EDP management will have to be changed if efficient management is desired.

Characteristics of Federal Data Processing Management

The Federal EDP management scene has several characteristics that are immediately obvious. These include:

- Complex Social Equity Considerations.** Considerations of social equity are important in decisions affecting data processing as well as in other areas of government expenditure. Examples are small business and minority set asides and the desire for computer industry competitiveness in government procurement.
- Long Lead Times For Projects.** The lead time for a system acquisition can be very long. Eight years is not an uncommon figure in the authors' experience. In the private sector, eight years would be a complete systems life cycle from initial concept through operation to replacement.
- Old Computer Systems.** One survey of 1,366 medium and large scale processors found an average age of 7 years. The majority of the installations use computers that had first been introduced 12 or more years earlier.
- Fiduciary Management Dominates EDP Management.** Government managers take a fiduciary view rather than a managerial view. Preventing fraud, waste and abuse of government funds is almost always more important than using them.
- Specialized "One-of-a-Kind" Systems.** There is a tendency to do tailor-made systems instead of relying on off-the-shelf software to perform functions.
- Lack of Strategic EDP Planning.** EDP planning is not an institutionalized process in the Federal government. Long range strategic plans for the use of EDP resources are rare. Systems are organized on a project

basis. A new EDP system is a project to solve a particular problem and not as part of an on-going problem solving process.

Some people view these problems as isolated symptoms which can be corrected merely by solving each one individually. This, however, is fallacious. As we shall show below, these are not isolated symptoms, but are interdependent characteristics of the political processes surrounding Federal EDP management. Any solution to the problems of Federal EDP management must address the political considerations which generate them. Solutions not considering this fundamental aspect of Federal EDP management will surely fail.

As an example, consider the case of the Social Security System's computers. This was a model system when first installed in the 1960's, but, until recently, little was done to update the system. For years, the system has been teetering on the edge of disaster. Congress authorized new computers in an upgrade that is conservatively estimated at \$479 million. Congress balked at an all-IBM installation. So, one plan was devised to split the computer system into seven sections so that other companies could bid on the equipment more readily.

No rational EDP manager would consider such a solution. The problems of running a seven-way mixed shop would drive costs through the ceiling. In setting these requirements Congress was not looking at the problem from the point of view of EDP management. They focused on the issue of social equity. Additionally, standardizing on IBM makes the computer industry less competitive. An equipment decision of this size could spell the difference between survival and bankruptcy for some companies.

These companies are somebody's constituents. Such considerations are clearly not relevant for a private sector decision maker.

Sorting out these political issues takes time and is the major contributor to the long procurement lead times found in government. Political negotiating must take place before we can arrive at a solution accepted as fair by all. Government procurement processes have institutionalized these political negotiations into a complex competitive bidding system which is costly to both government and vendors. As an example, the requirement that systems undergo extensive benchmarking is costly in both construction and analysis of the benchmarks. While benchmarks give an air of fairness to the selection process, they do little to guarantee selection of the best possible system.

These considerations of social equity and diverse goals within the government make for complex systems with long lead times. An example is the area of payroll systems. Payrolls are common EDP applications. The first true data processing program was a payroll system constructed at General Electric in 1954. By now, we should have wide experience with payrolls, yet the government has always had problems in the construction of payroll systems. Let's see why this is true.

Consider a hypothetical Navy payroll situation. The Navy operates a centralized payroll system out of Cleveland. Suppose that we have a sailor who is qualified as a diver but who normally holds a desk job in Naples, Italy. While working as a diver, he is eligible for hazardous duty pay. Suppose additionally that he does three days special duty as a diver, which affects his pay for the period in question. Because he is in Italy, we have a further complication. To ease currency exchange problems, a portion of his

salary is paid in Italian lira at the current exchange rate. To compute his paycheck, the center in Cleveland must receive timely notification of his three days duty as a diver, perform the currency exchange calculations, compute his paycheck, and get it to him in Naples.

Compound this problem with many similar local rules and pay rates and you begin to see the reason for the complexity of government EDP systems. Notice that all the rules are individually rational. Incentive pay for special duty is a long-accepted compromise for complex issues in military pay rates. The currency exchange rules make for easier economic relations with other governments.

The result from an EDP management view is an administrative nightmare. There are volumes of complex, constantly changing rules that must be accommodated in designing and maintaining such systems. Long lead times for such systems are not surprising. The surprising thing is that the government actually does finish some systems. Piecemeal rationality has led to large scale irrationality. Although these problems also exist in the private sector, they are worse in the Federal government because of the size of systems and the complex system interrelationships.

These are some of the factors causing long lead times in system design and implementation. Long lead times further add to the problem of outdated computer systems. By private sector standards, much of the government's computer inventory has outlived its economic usefulness. The government purchases most of its computer equipment. The average age of general purpose computers in government service is about seven years. Figure 1 shows the distribution of ages. Keep in mind that this seven years is the age of the equipment. The technologies are at least two to three years older.

In the private sector it is cheaper to replace the equipment than to continue paying the costs to operate it. From the point of view of a government manager, however, this is not true. This is because the government manager perceives a different set of costs than a private sector manager. In the government, a major cost of a new system is the cost of justifying the replacement of the old system. Because of the extensive system of checks and balances required for spending public money, this justification involves much administrative time and expense. The manager must divert a large share of the staff's energies into tedious paperwork to meet the requirements of the checks and balances. While doing this, they are also supposed to be running the old system. Hence, for a Federal EDP manager, a major cost of a new system is the administrative cost paid to justify it. This administrative cost is hard to compute explicitly, but it is real and it is high. It results in the true cost of replacement of the government system being much higher than for a similar system in the private sector.

This extensive justification process makes the economic life of systems in the Federal government much longer than those in the private sector. Most Federal managers who have been through this process hope that they will retire before their new system must be replaced. It is small wonder that most managers opt for making small improvements to outdated systems instead of trying to replace them.

This brings us to tailor-made systems. Many government computer systems are one-of-a-kind systems designed for a particular application or organization. Government computer shops lag behind similar shops in the private sector in the use of off-the-shelf software and software tools. Many critics cite this as an area where government computer managers can improve productivity. A 1980 report by the General

Accounting Office recommended using new software technology tools to speed up system development. Examples of such tools include program generators, program libraries, data base systems, preprocessor packages, fourth generation retrieval languages, and so on. There is little doubt that these tools can improve productivity dramatically.

In government installations, it is not uncommon to find one-of-a-kind systems existing that accomplish the functions of off-the-shelf software tools. Such systems operate as local systems programs. When the manufacturer of the computer system provides a new software release, the users must update their locally-produced systems programs if they wish to take advantage of the new capabilities.

As an example, the Navy Supply Corps has systems which use Navy-written database management modules. These provide a few, but by no means all, of the features found in commercial database management systems. The cost of updating these database systems is large. Their unique features have found their way into many of the programs that the Supply Corps uses to process its data. Maintaining these unique systems and the applications software that uses them is costly, since the Supply Corps has about 20 million lines of COBOL code to maintain.

Have government managers developed this unique software because they are uninformed about private sector developments? No, they are just not in a position where they can take advantage of these systems. Most of the productivity-enhancing software (database management systems, fourth generation languages, etc.) runs only on IBM compatible hardware. The social equity considerations in procurement keep government managers off IBM hardware. It is not unreasonable that most of this software is restricted to IBM compatible machines. IBM has the major hardware market

share for customers of this type of software. However, Figure 2 shows the distribution of computer equipment by manufacturer for government systems costing more than \$50,000. IBM has a little less than 12 percent of the market. A comparable graph for the private sector would show at least a 60 percent market share for IBM in this category.

The cost-oriented management view taken in the government also contributes to the tendency toward one-of-a-kind systems. In government spending, all dollars are not the same. It is usually possible to obtain funds to hire programmers to make marginal improvements to an old system, but it may be difficult to use those funds to buy new equipment. Or, if the dollars are there, as in the Social Security case, the process may dissolve into an interminable political battle over how to divide them up. In such a world, one-of-a-kind systems are rational behavior.

The last of our characterizations of Federal EDP management is that the strategic planning process is weak. There is now general acceptance in the private sector of the necessity of top management involvement in strategic planning in order to have successful information systems. However, in the Federal government, we have problems of continuity in top management that private industry does not have.

The entire top management structure of government can change every four years. It might be argued that this should not be a problem. After all, corporate management teams change frequently as well, and they are still able to set up strategic planning procedures. But, the process by which corporate management changes is different. In government, a new management team comes to power by running against the policies of the old team. By implication, the old team is incompetent, so replacement is the

only cure. This is analogous to an unfriendly corporate takeover. In most corporate management changes, however, the new management team has usually had a mentor relationship with the old team. Change is more gradual, and there is much greater continuity in policies and procedures. The new management team understands those policies and the processes by which they were formed. They do not require the setup time that a new government administration requires before they can become fully functional.

The result is that planning, if any, is dependent on individual management styles. It is not a routine procedure in the organization. It may be that the current incumbent in a job sees a need for long range planning and pursues it. His successor is unfamiliar with the situation and may have a different set of priorities. The next manager often abandons these planning processes before they can have any effect. In our observations, this happens more often than not. Since mentor relationships and procedure-based planning are more common in the private sector, change is more orderly. A further difficulty here is that the turnover in high-level government management is much higher than in the private sector. But even if the rate of management turnover were the same in both sectors, the long range planning process would still be more difficult to establish in government.

Outside observers looking at this list often conclude that government EDP managers must be incompetent. Americans tend to be disdainful of government anyway, so this is a conclusion that is easily reinforced. The solutions in this view are simple:

1. Get new computer equipment.
2. Throw out the incompetents responsible for the long lead times.

3. Hire professionally-oriented EDP management.
4. Concentrate on better measures of efficiency such as those used in the private sector.
5. Do away with special purpose systems and buy off-the-shelf.
6. Set up groups responsible for long term strategic EDP planning.

Interestingly enough, one hears these proposals from government employees about as often as from the private sector. Government EDP managers even share the idea that they, or at least some of their colleagues, must be incompetent managers. How else could things be in such a mess?

It is our observation that government EDP managers are not incompetents. Those we have dealt with are at least as good as their counterparts in the private sector. They are rational people responding rationally to a different set of ground rules than those which exist outside government. Deeply held values in society at large generate these ground rules, and they will not be changed by any of the solutions suggested above. The proposed solutions deal with symptoms and not causes. The solutions require measures of efficiency that society has decided are inappropriate for government.

The Grace Commission

In 1982, President Reagan established the President's Private Sector Survey on Cost Control (PPSSCC) with J. Peter Grace as the Chairman of its Executive Committee. The PPSSCC, informally known as the Grace Commission, was charged with studying improvements in government operations. It tried to apply private sector management techniques to the Federal government and to recommend areas of managerial improvement and cost savings. One task force of the Grace Commission examined Automated Data Processing/Office Automation. Its report was released in September 1983[1].

The major findings and recommendations of the report were:

- A Federal Information Resource Manager should oversee EDP/OA throughout the government.
- A qualified Senior Executive Service career professional should oversee EDP/OA management at each agency.
- The General Services Administration (GSA) should grant agencies more procurement authority and enhance GSA technical assistance.
- Agencies should upgrade or replace uneconomic and obsolete EDP/OA systems.
- Teleprocessing (TP) costs should be documented separately and TP networks should be shared.
- Government should improve management of OA and emphasize its use for managerial/professional personnel.
- Improve salaries and hiring procedures for EDP personnel.

The overall net savings from these recommendations were projected at \$29.5 billion over three years.

We do not intend to discuss the details of these recommendations since that is a topic all to itself, but it is easy to see the similarities between these recommendations and the proposed solutions presented in the section above. Unfortunately, it appears that none of these recommendations addresses the underlying political processes which created the problems. Consequently, we are skeptical on two counts. First, can these recommendations save the amounts projected? Second, can most of these recommendations ever be implemented?

We are not alone in our pessimism about the projected savings. The Congressional Budget Office examined the major proposals (including EDP), and reduced the projected savings by approximately 70 percent[2]. The fundamental problem with most of the Grace Commission proposals, including those for EDP and office automation, is that they do not recognize that the Federal government is not the private sector. Although several recommendations will provide some savings, most of those claiming big dollar savings are not implementable. They do not anticipate and alleviate the national political problems they would generate. So what can be done?

Living With the System

The situation facing the Federal government EDP manager is not enviable. The manager must manage resources efficiently while operating within constraints defined by the political process. Major tradeoffs of resources are not the manager's to make. At the aggregate level, these tradeoffs are made by the political process, leaving the manager little room for further maneuver. There is little likelihood that the rules will be changed. They cover many areas of government outside EDP management. The political processes that generated these rules were developed over many years of compromise and negotiation. The stakes are too large for widespread, rapid change.

There are developments taking place in government that may make the political tradeoff process less costly. Whether they will succeed is uncertain. One approach is to lengthen the life cycle of a system. This seems bizarre at first glance since a major problem is that the Federal EDP system life cycle is already too long. But along with the longer life cycle comes a broader definition of a system. The new approach sensibly defines the information system by the functions it performs. The hardware and software performing the functions become the means not the ends. The procurement contract sets specific performance goals for these functions. If an increased workload means that these goals are not met, more equipment is purchased. It is not necessary to go through an entire procurement justification. Since hardware types are not specified in the contract, it is possible for the vendor to install newer equipment if this is the cheapest way to meet performance goals. If the vendor cannot fulfill these goals at certain evaluation points, then the government can get another vendor.

Initially, this might seem to offer some relief from the long lead times. The lead time for negotiating the initial contract is as long as ever. Once the political tradeoffs are made, however, they last for, say, the twenty-five year life of the contract. At least this is the theory. In fact, there are likely to be problems. The government has to worry about possible problems of non-performance or the possibility of getting a better deal elsewhere. The twenty-five year contract can be up for grabs every eight years. If the stakes are large enough, it will be worthwhile for somebody to reopen the issue. This means a whole new round of political tradeoffs and negotiations.

The other possibility is to contract out EDP services. Suppliers of EDP services can be selected by competitive bid. The suppliers can decide the cheapest means of delivering the services. Presumably, this would short circuit the political problems mentioned earlier--at least suppliers of EDP services in the private sector think so. Actually, this could just be a case of moving the battle to a different field or of just changing the rules slightly. For decisions of this magnitude, there will still be a complicated and lengthy selection process for the supplier of the services. There will still be politically-inspired rules that will constrain the supplier of EDP services.

This is likely to continue if most suppliers of contract EDP services are small. So far, the stakes involved are not large. It is not worth initiating political battles for such small returns. However, suppose that the government were to begin contracting out large scale EDP services such as Social Security or selected administrative activities of the Department of Defense. In that case, the return would be worth the fight.

One could expect then that the outside contractors would become fully subject to the political process. When that happened, their advantage over government-run EDP

operations would diminish accordingly. They would become government data processing operations under another name. Hence, contracting out EDP services is likely to provide some short term relief, but, as the stakes involved get larger, it is reasonable to expect the political process to intrude here as well.

Relief from several of these problems has recently come from the introduction and use of microcomputers. Users have been able to move work from mainframes to microcomputers. However, most of this work has been internal government administrative functions and not full-service production operations of the problem agencies. Even with rapid technological changes, it is difficult to envision Social Security production operations being placed on a network of micros. Even if this occurred, the procurement of large quantities of micros involving large dollar contracts will create the same problems discussed earlier. So, while micros have helped, they cannot solve all problems.

Conclusions

The basic problem with Federal EDP management is not the quality of management. The problem is that the systems acquisition and design processes are naturally influenced by larger political goals. The acquisition process was designed by Congress, the Executive Branch, and industry, and it has benefits for all. No one group has custody of the acquisition process, and there are many dysfunctional incentives built into it. Any participant can slow the process down, but no group has any incentive to fight to make the process more efficient. It is one more example of Bret Harte's old adage that nobody shoulders a rifle in defense of a boarding house. About the only forces

keeping the system from reaching total chaos are the public service norms emphasized in government employment. Somehow, the work gets done.

The government could speed up the computer acquisition process. It could decide that the process is an inappropriate means to pursue some social goals. In particular, the government should give up trying to regulate the computer industry through the government equipment acquisition process. Considering the impact on the government's administrative systems, this strategy is not cost effective. If the government wants to regulate the industry, it should do so directly through the Antitrust Division of the Justice Department, the Federal Trade Commission, or by encouraging private lawsuits. We realize there is little hope of this kind of recommendation being adopted. Antitrust policies are popular with both the public and businesses whose competitors may be hampered by vigorous antitrust enforcement.

The systems design problem is not easily handled either. Government computer systems are in trouble because they are large and complex. This is, in part, a reflection of the social system in which they are imbedded. The systems are large because the government deals with large real world problems. The complexity comes out of the political process.

We have many different groups competing in the political process. This competition generates complicated political tradeoffs. Government computer systems, as do other governmental components, merely reflect these tradeoffs. If we were a more homogeneous country such as Japan, perhaps we could get by with simpler systems, but we are not. Congress and the public at large need to appreciate the impact of their demands on the systems that service their demands. If we want simpler, more cost effective systems, we will have to sacrifice some of the complexity of our demands.

NOTES

- [1] *U.S. President's Private Sector Survey on Cost Control, "Report on Automated Data Processing/Office Automation,"* U.S. Government Printing Office, 1983.
- [2] Congressional Budget Office, *Analysis of the Grace Commission's Major Proposals for Cost Control,* Government Printing Office, Washington, D.C., February 1984.

FIGURE ONE
AGE OF GOVERNMENT COMPUTER SYSTEMS

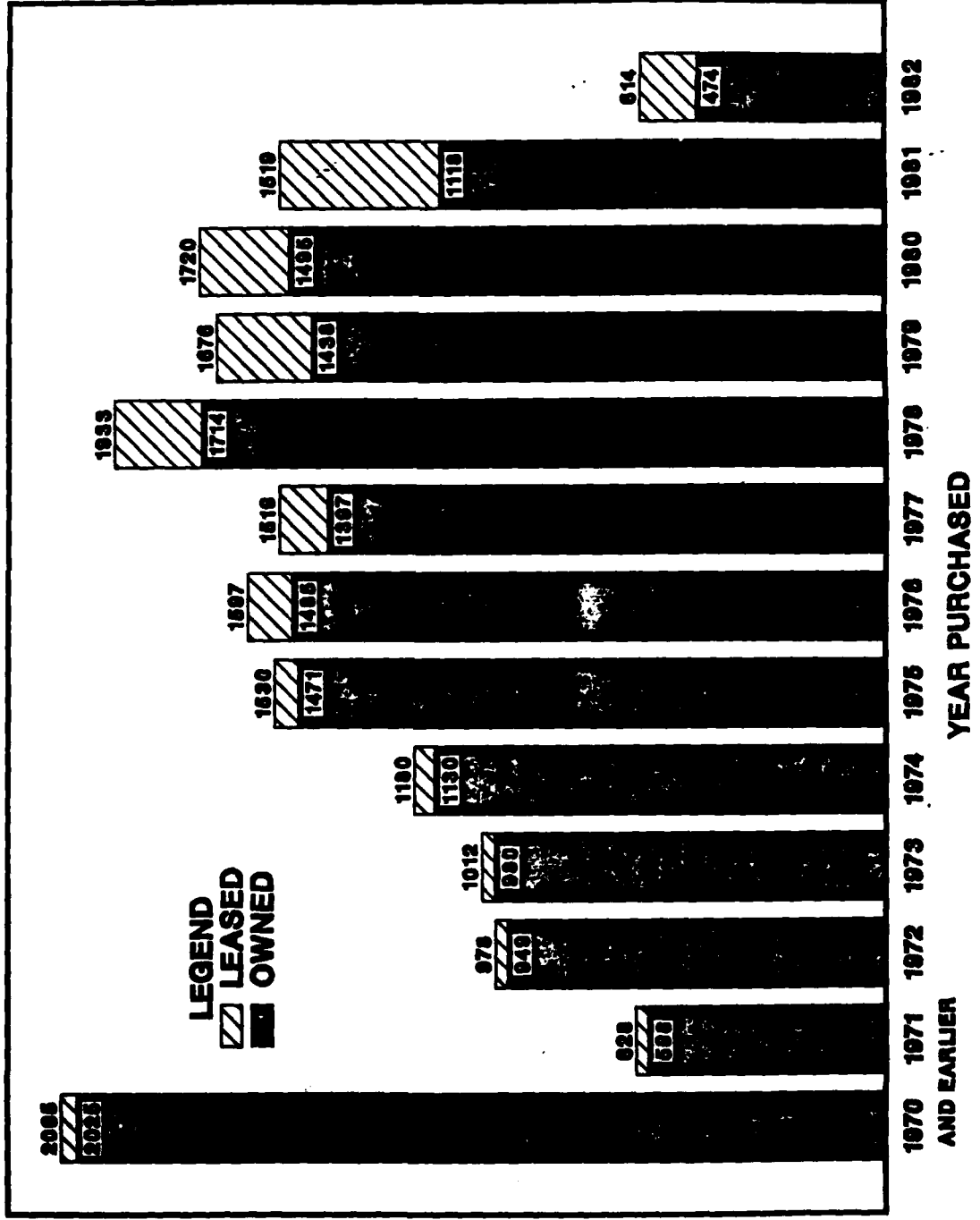
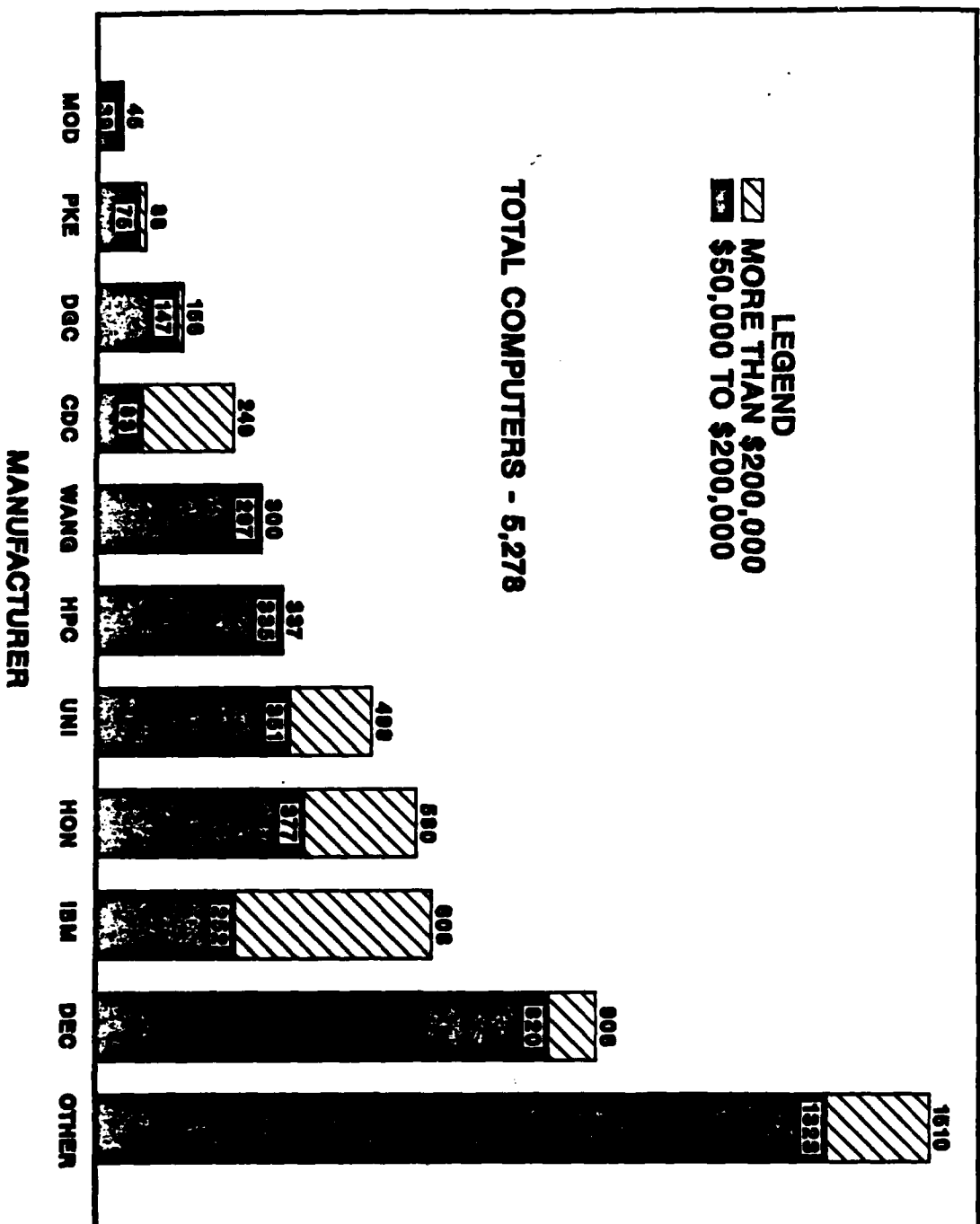


FIGURE TWO GOVERNMENT COMPUTERS BY MANUFACTURER



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